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| <b>Fiscal Year:</b>                               | FY 2012  | <b>Task Last Updated:</b>             | FY 02/24/2012  |
| <b>PI Name:</b>                                   | Lee, Mun Wai Ph.D.   |                                       |                |
| <b>Project Title:</b>                             | ESPRIT: Exercise Sensing and Pose Recovery Inference Tool  |                                       |                |
| <b>Division Name:</b>                             | Human Research   |                                       |                |
| <b>Program/Discipline:</b>                        | HUMAN RESEARCH   |                                       |                |
| <b>Program/Discipline--Element/Subdiscipline:</b> | HUMAN RESEARCH--Biomedical countermeasures   |                                       |                |
| <b>Joint Agency Name:</b>                         | <b>TechPort:</b>   | No                                    |                |
| <b>Human Research Program Elements:</b>           | (1) <b>HHC:</b> Human Health Countermeasures   |                                       |                |
| <b>Human Research Program Risks:</b>              | (1) <b>Muscle:</b> Risk of Impaired Performance Due to Reduced Muscle Size, Strength and Endurance   |                                       |                |
| <b>Space Biology Element:</b>                     | None   |                                       |                |
| <b>Space Biology Cross-Element Discipline:</b>    | None   |                                       |                |
| <b>Space Biology Special Category:</b>            | None   |                                       |                |
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| <b>PI Organization Type:</b>                      | INDUSTRY   | <b>Phone:</b>                         | (301) 294-4762 |
| <b>Organization Name:</b>                         | Intelligent Automation, Inc.   |                                       |                |
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| <b>PI Web Page:</b>                               |  |                                       |                |
| <b>City:</b>                                      | Rockville  | <b>State:</b>                         | MD             |
| <b>Zip Code:</b>                                  | 20853-2737   | <b>Congressional District:</b>        | 8              |
| <b>Comments:</b>                                  |  |                                       |                |
| <b>Project Type:</b>                              | GROUND   | <b>Solicitation / Funding Source:</b> | SBIR Phase II  |
| <b>Start Date:</b>                                | 06/14/2012   | <b>End Date:</b>                      | 06/18/2014     |
| <b>No. of Post Docs:</b>                          | <b>No. of PhD Degrees:</b>   |                                       |                |
| <b>No. of PhD Candidates:</b>                     | <b>No. of Master' Degrees:</b>   |                                       |                |
| <b>No. of Master's Candidates:</b>                | <b>No. of Bachelor's Degrees:</b>  |                                       |                |
| <b>No. of Bachelor's Candidates:</b>              | <b>Monitoring Center:</b> NASA JSC   |                                       |                |
| <b>Contact Monitor:</b>                           | Norsk, Peter   | <b>Contact Phone:</b>                 |                |
| <b>Contact Email:</b>                             | <a href="mailto:Peter.norsk@nasa.gov">Peter.norsk@nasa.gov</a>   |                                       |                |
| <b>Flight Program:</b>                            |  |                                       |                |
| <b>Flight Assignment:</b>                         | NOTE: End date changed to 6/18/2014 per HRP technology information (Ed., 8/28/14)<br>NOTE: Aerobic Risk added per IRP Rev E (Ed., 3/19/14)<br>Period of performance changed to 6/14/2012-6/13/2014 (from 1/31/12-1/31/14) per HRP Master Task List information dated 12/28/12 (Ed., 3/13/2013) |                                       |                |
| <b>Key Personnel Changes/Previous PI:</b>         |  |                                       |                |
| <b>COI Name (Institution):</b>                    |  |                                       |                |
| <b>Grant/Contract No.:</b>                        | NNX11CG03P   |                                       |                |
| <b>Performance Goal No.:</b>                      |  |                                       |                |
| <b>Performance Goal Text:</b>                     |  |                                       |                |

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| <b>Task Description:</b>                    | <p>Crew exercise is important for maintaining the health and fitness of astronauts, and to prevent adverse health problems, such as bone density losses. We developed algorithms for ESPRIT: an Exercise Sensing and Pose Recovery Inference Tool, in support of NASA's Exercise Countermeasure Program. ESPRIT is a stereo camera system that monitors exercise activities, detects markers placed on the body and other image features and recovers 3D kinematic body pose. ESPRIT relies on strong prior knowledge and modeling of human body, pose, dynamics, and appearance. It also relies on advanced statistical inference techniques to achieve robust and accurate motion capture. Phase I result has been promising and has demonstrated motion capture of several exercises, including walking, curling and dead lifting. Phase II effort will focus on enhancement of algorithms, development of an ESPRIT prototype, detailed performance evaluation, and delivery of prototype for testing and demonstration.</p> <p>POTENTIAL NASA COMMERCIAL APPLICATIONS: Crew exercise is important for maintaining health and fitness of astronauts, especially in preventing adverse health problems associated with long-duration space flight, such as losses in muscle strength and endurance, bone density, balance and aerobic capacity. The proposed ESPRIT system will support NASA's Exercise Countermeasure project for observing crew's exercise activities, performing motion capture and kinematic analysis, and will contribute towards the understanding the effect of microgravity in physical activities. ESPRIT is designed to satisfy the constraints in size, weight and power consumption imposed by the spacecraft environment. The system will be easy to set up and operated by the crew.</p> |
| <b>Rationale for HRP Directed Research:</b> |   |
| <b>Research Impact/Earth Benefits:</b>      | <p>Non-NASA applications include uses in medicine and rehabilitation, such as gait analysis, orthopedics, and other applications for monitoring skeletal movement. Other applications include personal fitness and support of the aging, human-robotics and human-computer interaction, simulation, immersive reality, and video games. Potential customers include government research agencies such as Air Force Research Laboratory for human performance analysis and human factor engineering; National Institute of Health for rehabilitation research; physiotherapy clinics and nursing homes.</p>  |
| <b>Task Progress:</b>                       | <p>New project for FY2012. Reporting not required for this SBIR Phase 2 project.</p>  |
| <b>Bibliography Type:</b>                   | <p>Description: (Last Updated: )</p>  |